LIND
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EXHIBIT 1
DATE 3-30-07
SB 431

Given that an unknown amount of the acid has dissociated, [HCOOH] will be reduced by this amount, while $[H^+]$ and $[HCOO^-]$ will each be increased by this amount. Therefore, [HCOOH] may be replaced by $0.1 - x$, and $[H^+]$ and $[HCOO^-]$ may each be replaced by x, giving us the following equation:

$$1.6 \times 10^{-4} = \frac{x^2}{0.1 - x}$$

Solving this for x yields 3.9×10^{-3}, which is the concentration of hydrogen ions after dissociation. Therefore the pH is $-\log(3.9 \times 10^{-3})$, or about 2.4

Measurement

pH can be measured:

- by addition of a pH indicator into the solution under study. The indicator color varies depending on the pH of the solution. Using indicators, qualitative determinations can be made with universal indicators that have broad color variability over a wide pH range and quantitative determinations can be made using indicators that have strong color variability over a small pH range. Extremely precise measurements can be made over a wide pH range using indicators that have multiple equilibriums in conjunction with spectrophotometric methods to determine the relative abundance of each pH-dependent component that make up the color of solution, or
- by using a pH meter together with pH-selective electrodes (pH glass electrode, hydrogen electrode, quinhydrone electrode, ion sensitive field effect transistor and others).

As the pH scale is logarithmic, it doesn't start at zero. Thus the most acidic of liquids encountered can have a pH of as low as −5. The most alkaline typically has pH of 14.

Representative pH values

Substance	pH
Hydrochloric Acid, 1M	0.1
Battery acid	0.5
Gastric acid	1.5 – 2.0
Lemon juice	2.4
Cola	2.5
Vinegar	2.9
Orange or apple juice	3.5
Beer	4.5
Acid Rain	<5.0
Coffee	5.0
Tea or healthy skin	5.5
Milk	6.5
Pure Water	7.0
Healthy human saliva	6.5 – 7.4
Blood	7.34 – 7.45
Sea water	8.0
Hand soap	9.0 – 10.0
Household ammonia	11.5
Bleach	12.5
Household lye	13.5
Caustic Soda	13.9

pOH

There is also **pOH**, in a sense the opposite of pH, which measures the concentration of OH^- ions, or the basicity. Since water self ionizes, and notating $[OH^-]$ as the concentration of hydroxide ions, we have

$$K_w = a_H \, a_{OH^-} = 10^{-14} \, (*)$$

where K_w is the ionization constant of water.

Now, since